General

Title

Pediatric readmissions: percentage of admissions followed by one or more readmissions within 30 days, for patients less than 18 years old.

Source(s)

Center of Excellence for Pediatric Quality Measurement (CEPQM). Basic measure information: pediatric all-condition readmission measure. Boston (MA): Center of Excellence for Pediatric Quality Measurement (CEPQM), Boston Children's Hospital; 13 p.

Center of Excellence for Pediatric Quality Measurement (CEPQM). Pediatric all-condition readmission measure: detailed specifications. Boston (MA): Center of Excellence for Pediatric Quality Measurement (CEPQM), Boston Children's Hospital; 2014 Feb. 31 p. [2 references]

Measure Domain

Primary Measure Domain

Related Health Care Delivery Measures: Use of Services

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure calculates case-mix-adjusted readmission rates, defined as the percentage of admissions followed by one or more readmissions within 30 days, for patients less than 18 years old.

This measure focuses on patients discharged from general acute care hospitals, including children's hospitals.

Rationale

Readmissions disrupt the lives of patients and families, expose patients to risks of harm during

hospitalization, and are costly. The number of children who experience readmissions is substantial, and readmission rates for some conditions are high. Readmissions signal the quality of disease management, indicating a worsening of health status that in some cases may have been prevented. They also can reflect the quality of key processes, including discharge planning and education, care transitions, and follow-up care. In addition, disparities in pediatric readmission exist based on race/ethnicity, socioeconomic status, and special health care needs. Readmission rates vary among hospitals, and effective interventions to reduce readmissions have suggested potential for improvement.

Evidence for Rationale

Center of Excellence for Pediatric Quality Measurement (CEPQM). Basic measure information: pediatric all-condition readmission measure. Boston (MA): Center of Excellence for Pediatric Quality Measurement (CEPQM), Boston Children's Hospital; 13 p.

Primary Health Components

Pediatric readmissions

Denominator Description

Hospitalizations at general acute care hospitals for patients less than 18 years old (see the related "Denominator Inclusions/Exclusions" field)

Numerator Description

Hospitalizations at general acute care hospitals for patients less than 18 years old that are followed by one or more readmissions to general acute care hospitals within 30 days (see the related "Numerator Inclusions/Exclusions" field)

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

A clinical practice guideline or other peer-reviewed synthesis of the clinical research evidence

A formal consensus procedure, involving experts in relevant clinical, methodological, public health and organizational sciences

A systematic review of the clinical research literature (e.g., Cochrane Review)

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

Prevalence of Readmissions

Readmissions within 30 days occur for 2% to 6% of hospitalizations in children (Jencks, Williams, & Coleman, 2009; Wick et al., 2011; Berry et al., 2013; Jiang & Wier, 2010). Just over 20% of children are readmitted within one year (Berry et al., 2011). Most studies of pediatric readmission thus far have been conducted in children's hospitals, which serve a greater prevalence of children with complex chronic

conditions and associated high resource utilization and thus may not be representative of other hospitals that serve children (Simon et al., 2010).

Certain subgroups of children have frequent readmissions. Children with sickle cell disease have much higher readmission rates than the overall pediatric population (Leschke et al., 2012; Sobota et al., 2012; Brousseau et al., 2010). Those with acute appendicitis are also readmitted at relatively high rates (Lautz & Reynolds, 2011; Rice-Townsend et al., 2013; Morse et al., 2013). Children with complex chronic conditions and medical technology dependencies tend to have multiple, frequent readmissions and account for a disproportionately large proportion of readmissions and bed days (Berry et al., 2011; Gay et al., 2011). Although some readmissions for these children with special health care needs may be due to unavoidable reasons such as inevitable disease progression, others may be avoidable with improvements in such areas as care coordination, discharge transitions, or follow-up care.

Readmission Rates Vary by Age

Pediatric readmission rates vary by age, with relationships between readmission risk and age depending on the population in question. A study of readmission to children's hospitals following hospitalizations for all conditions demonstrated that patients 13 to 18 years old have higher readmission rates than younger children (Berry et al., 2013). A study of Medicaid-insured children admitted to children's or non-children's hospitals likewise showed that those 13 years or older had the highest readmission rates (Jiang & Wier, 2006). However, analysis of Medicaid-insured children admitted to children's or non-children's hospitals using our candidate measure, which excludes admissions for birth of healthy newborns, indicated that patients less than 1 year of age were at highest risk of readmission.

Social and Clinical Burdens of Readmission

Hospitalization of a child is disruptive to families. It can affect parent/caregiver work and sibling school or daycare arrangements and expose families to various psychosocial stressors (Shudy et al., 2006; Rennick et al., 2002). In addition, readmission exposes patients to additional hospital days and thus increased potential for infections and medical errors, which are common during hospitalization (Aspden et al., 2007; Kohn, Corrigan, & Donaldson, 2000).

Fiscal Burden of Readmission

Readmissions among pediatric patients are costly. A study of readmissions within 6 months in 48,000 patients with initial preventable admissions found a total hospital cost of readmissions of $136 million (Friedman & Basu, 2004). In a study of patients admitted to children's hospitals during a 1-year period, readmissions for children with frequent rehospitalizations (=4 during the year) accounted for about $2.8 billion of the $14.7 billion in total hospital charges for the entire cohort (Berry et al., 2011). Parents and other caregivers also incur time and monetary costs while a child is hospitalized (Leader et al., 2002).

Association of Readmission with Children's Future Health

Frequent hospitalization may have negative developmental effects, including anxiety and feelings of isolation, particularly for children who are chronically ill and return to school after prolonged hospitalizations (Worchel-Prevatt, et al., 1998). Frequently-hospitalized adolescents are more likely to drop out of school than their healthy peers (Weitzman et al., 1982; Kearney, 2008). School reintegration can be complicated by side effects caused by treatment or the illness itself or by increased social, emotional and behavioral problems (Shaw & McCabe, 2008).

Variation in Readmission Rates

Multiple studies have revealed variation in pediatric readmission rates, suggesting that at least some health systems have the potential to reduce readmissions. A study of readmissions following hospitalization at both children's and non-children's hospitals for 7 common conditions identified few hospitals that met criteria for being an outlier but found significant variation in readmission rates across hospitals for all but 1 condition (Bardach et al., 2013). In a study of readmissions to children's hospitals, readmission rates varied significantly across hospitals for 8 of the 10 diagnoses with the highest number

of readmissions (Berry et al., 2013).

Potential for Quality Improvement

Adults at high risk of readmission toward whom interventions to reduce readmissions could be targeted include those who are older, have chronic or multiple co-morbidities, possess limited financial resources, or lack social or emotional support (Golden et al., 2010; Harrison et al., 2011; Kangovi et al., 2012; Strunin, Stone, & Jack, 2007).

Most evidence for strategies to improve readmission rates arises from studies of adults, particularly those greater than 65 years old with cardiac conditions (Santamour, 2011). Results for multi-component interventions are most promising (Gilfillan et al., 2010; Sochalski et al., 2009; Flood et al., 2013; Phillips et al., 2004; Naylor et al., 2004; Coleman et al., 2006), whereas those for single-component interventions are mixed (Harrison et al., 2011; Ballard et al., 2010; Mistiaen & Poot, 2006; Costantino et al., 2013; Hansen et al., 2011). Single-component interventions effective in reducing readmissions for patients with heart failure include home visits and telephone or telemonitoring follow-up (Inglis et al., 2010; Scott, 2010). Multicomponent interventions have reduced readmissions in several adult populations with various clinical conditions. These interventions include use of a primary care medical home model (Gilfillan et al., 2010), multi-disciplinary heart failure care management (Sochalski et al., 2009), and provision of inpatient care in an interdisciplinary Acute Care for Elders unit (Flood et al., 2013). Effective multi-component interventions aimed at improving peri-discharge management include comprehensive discharge planning plus post-discharge support for heart failure and involvement of advanced practice clinicians (Phillips et al., 2004; Naylor et al., 2004; Coleman et al., 2006). In addition, a number of national and other large-scale efforts are addressing readmission rates for adults by improving care transitions (Boutwell et al., 2011; Institute for Healthcare Improvement, 2013; Society of Hospital Medicine, 2013; Hansen et al., 2013; Centers for Medicare & Medicaid Services, 2013).

In children, Medicaid insurance and having complex chronic conditions are associated with higher readmission rates (Jiang & Weir, 2006; Berry et al., 2011; Brousseau et al., 2010; Rice-Townsend et al., 2013; Gay et al., 2011; Liu & Pearlman, 2009). Non-white race has also been identified as a risk factor (Berry et al., 2011). Disease-specific readmission risk factors have been described for patients with sickle cell disease and asthma (Sobota et al., 2012; Frei-Jones, Field, & DeBaun, "Risk factors," 2009; Reznik, Hailpern, & Ozuah, 2006; Carroll et al., 2010). The relationship of having a medical home with hospitalizations is variable (Kim et al., 2011; AAP Council on Children with Disabilities, 2005; Homer et al., 2008), but having poor access to a medical home may be associated with increased readmissions (Auger et al., 2013).

Interventions to reduce readmissions for children have not yet been widely studied (Cooper et al., 2006). However, as in adults, improving the quality of care during the peri-discharge period and the transition period to home, particularly with regard to knowledge reinforcement and self-management activation for children with chronic illnesses that require substantial self-management (e.g., asthma, sickle cell disease), is effective in decreasing readmissions (Leschke et al., 2012; Fassl et al., 2012; Davis et al., 2011; Boyd et al., 2009; Frei-Jones, Field, & DeBaun, "Multi-modal," 2009).

Evidence for Additional Information Supporting Need for the Measure

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Extent of Measure Testing

Reliability

The measure was developed and tested using multiple claims datasets: 2008 Medicaid Analytic eXtract (MAX) data for 26 states, which include Medicaid claims from children's and non-children's hospitals; 2005 to 2009 Agency for Healthcare Research and Quality (AHRQ) revisit data for New York and Nebraska, which include claims for all payers from children's and non-children's hospitals; July 2009 to June 2010 National Association of Children's Hospitals and Related Institutions (NACHRI) case-mix data, which include claims for all payers from 72 acute care children's hospitals in 34 states; and the 2009 Kids' Inpatient Database (KID), which includes claims for all payers from children's and non-children's hospitals in 44 states. For the MAX and AHRQ revisit datasets, the developer chose which states' data to use based on assessment of data quality and completeness. All of the datasets except the KID can be used

to evaluate readmissions (although the NACHRI case-mix data only allow identification of readmissions back to the same hospital); the KID provides other useful information about pediatric hospitalizations, such as frequencies of diagnoses and procedures, and can be weighted to produce national estimates.

The reliability of hospital-level readmission rates was evaluated using the formula shown in the supplemental materials (refer to the original measure documentation for additional information). Reliability values range from 0 to 1. If perfect information from a very large sample were available for a hospital, so the hospital's random effect could be determined with perfect precision, then the reliability of that hospital's readmission rate would approach 1. If no information were available for a hospital, then the reliability of that hospital's readmission rate would be 0.

Using the 26-state MAX dataset, it was determined that for hospitals with at least 25 pediatric admissions annually, the median reliability for hospital-level readmission rates was 0.47 (interquartile range 0.30 to 0.69). Reliability was greater than 0.5 for hospitals with at least 125 index admissions annually. Eight-nine percent (89%) of index hospitalizations occurred at hospitals whose readmission rate reliability was at least 0.5, while 74% of index hospitalizations occurred at hospitals whose readmission rate reliability was at least 0.7.

Use of hospital random effects in the case-mix adjustment model adjusts the readmission rate estimate toward the mean rate for the entire cohort of hospitals, more so for hospitals with low volume and correspondingly low readmission rate reliability (because for a hospital with little available data, estimation of the hospital's rate relies more on assumptions about the distribution of hospital rates than for a hospital with a large amount of data). As a result, a hospital that has a high or low unadjusted readmission rate but insufficient volume to estimate its readmission rate precisely is prevented from appearing to be an outlier when it might not be.

Validity

The validity of the measure's case-mix adjustment model was evaluated by assessing the discriminative ability of the model using the concordance (c-) statistic (Austin & Steyerberg, 2012; Steyerberg et al., 2010). Discrimination refers to how well the model distinguishes between subjects with and without the outcome (in this case, readmission) (Austin & Steyerberg, 2012). The c-statistic is a unitless measure of the probability that a randomly selected subject who experienced readmission will have a higher predicted probability of having been readmitted than a randomly selected subject who did not experience readmission (Austin & Steyerberg, 2012). The c-statistic for the case-mix adjustment model, when applied to the 26-state MAX dataset, was 0.69, which is very much in range with results for other 30-day readmission models (Rice-Townsend et al., 2013; Yale New Haven Hospital Services Corporation [YNHHSC] Center for Outcomes Research and Evaluation [CORE], "Hospital-wide," 2012; YNHHSC CORE, "Hospital-level," 2012; YNHHSC CORE, 2013).

Evidence for Extent of Measure Testing

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State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Hospital Inpatient

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Single Health Care Delivery or Public Health Organizations

Statement of Acceptable Minimum Sample Size

Specified

Target Population Age

Age less than 18 years

Target Population Gender

Either male or female

National Strategy for Quality Improvement in Health Care

National Quality Strategy Priority

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Not within an IOM Care Need

IOM Domain

Not within an IOM Domain

Data Collection for the Measure

Case Finding Period

Unspecified

Denominator Sampling Frame

Patients associated with provider

Denominator (Index) Event or Characteristic

Institutionalization

Patient/Individual (Consumer) Characteristic

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions
Hospitalizations at general acute care hospitals for patients less than 18 years old

Exclusions

The patient was 18 years old or greater at the time of discharge.

The hospitalization was for birth of a healthy newborn.

The hospitalization was for obstetric care, including labor and delivery.

The primary diagnosis code was for a mental health condition.

The hospitalization was at a specialty or non-acute care hospital.

The discharge disposition was death.

The discharge disposition was leaving the hospital against medical advice.

Records for the hospitalization contain incomplete data for variables needed to assess eligibility for the measure or calculate readmission rates, including hospital type, patient identifier, admission date, discharge date, disposition status, date of birth, primary diagnosis code, or gender.

The hospital is in a state not being analyzed. (Records for these hospitalizations are still assessed as possible readmissions, but readmission rates are not calculated for the out-of-state hospitals due to their lack of complete data.)

Thirty days of follow-up data are not available for assessing readmissions.

The hospital has less than 80% of records with complete patient identifier, admission date, and discharge date or less than 80% of records with complete primary diagnosis codes. (Records for these hospitals are still assessed as possible readmissions, but readmission rates are not calculated for these hospitals due to their lack of complete data.).

Records for the hospitalization contain data of questionable quality for calculating readmission rates, including

> Inconsistent date of birth across records for a patient
>
> Discharge date prior to admission date
>
> Admission or discharge date prior to date of birth
>
> Admission date after a discharge status of death during a prior hospitalization

Codes other than International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) procedure codes or International Classification of Diseases, Tenth Revision, Procedure Coding Systems (ICD-10-PCS) procedure codes are used for the primary procedure.

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions
Hospitalizations at general acute care hospitals for patients less than 18 years old that are followed by one or more readmissions to general acute care hospitals within 30 days

Exclusions
Readmissions are excluded from the numerator if the readmission was for a planned procedure or for chemotherapy.

Note:

Readmissions for planned procedures and for chemotherapy are part of a patient's intended course of care and thus unlikely to be related to health system quality. This measure therefore focuses on unplanned readmissions because they are more likely to be related to a defect in quality of care during the index admission or during the interval between the index admission and readmission. In adult and pediatric medicine, most planned readmissions are for planned procedures or chemotherapy; therefore, these exclusions are intended to capture the majority of planned admissions.

Planned Procedure: A procedure that was judged by expert reviewers to generally be scheduled at least 24 hours in advance for an expected medical need in more than 80% of cases and to be a potential reason for hospitalization (see Data Dictionary for International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM] or International Classification of Diseases, Tenth Revision, Clinical Modification [ICD-10-CM] procedure codes).

Planned Readmission: An admission to an acute care hospital with a primary ICD-9 or principal ICD-10 procedure code for a planned procedure, occurring within 30 days of discharge from a prior acute care hospitalization.

Index Admission: An eligible admission to an acute care hospital. The index admission serves as the starting point for enumerating readmissions.

Numerator Search Strategy

Institutionalization

Data Source

Administrative clinical data

Type of Health State

Proxy for Health State

Instruments Used and/or Associated with the Measure

Unspecified

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Does not apply to this measure (i.e., there is no pre-defined preference for the measure score)

Allowance for Patient or Population Factors

not defined yet

Description of Allowance for Patient or Population Factors

The model for this measure consists of a 2-level hierarchical logistic regression with fixed effects for patient-level characteristics and a random intercept for hospital. The first level of the model includes adjusters for hospital case-mix based on the patient-level characteristics of age, gender, and chronic disease comorbidity (identified using the Agency for Healthcare Research and Quality [AHRQ] chronic condition indicator tool). The second level of the model consists of a random effect for hospital. The hierarchical modeling adjusts for differences in case-mix and sample size across hospitals.

Refer to the original measure documentation for additional information.

Standard of Comparison

not defined yet

Identifying Information

Original Title

Pediatric all-condition readmission measure.

Measure Collection Name

Readmission Measures

Submitter

Center of Excellence for Pediatric Quality Measurement, Boston Children's Hospital - Hospital/Medical Center

Developer

Center of Excellence for Pediatric Quality Measurement, Boston Children's Hospital - Hospital/Medical Center

Funding Source(s)

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Financial Disclosures/Other Potential Conflicts of Interest

Unspecified

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2014 Mar

Measure Maintenance

Unspecified

Date of Next Anticipated Revision

Unspecified

Measure Status

This is the current release of the measure.

Measure Availability

Source not available electronically.

For more information, contact the Boston Children's Hospital at 300 Longwood Avenue, Boston, MA 02115; Phone: 617-355-6000, or 800-355-7944; Web site: www.childrenshospital.org

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NQMC Status

This NQMC measure summary was completed by ECRI Institute on May 25, 2016. The information was not verified by the measure developer.

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Production

Source(s)

Center of Excellence for Pediatric Quality Measurement (CEPQM). Basic measure information: pediatric all-condition readmission measure. Boston (MA): Center of Excellence for Pediatric Quality Measurement (CEPQM), Boston Children's Hospital; 13 p.

Center of Excellence for Pediatric Quality Measurement (CEPQM). Pediatric all-condition readmission measure: detailed specifications. Boston (MA): Center of Excellence for Pediatric Quality Measurement (CEPQM), Boston Children's Hospital; 2014 Feb. 31 p. [2 references]

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